A NEW METHOD

OF MAKING

ANATOMICAL PREPARATIONS:

PARTICULARLY THOSE RELATING TO

THE NERVOUS SYSTEM.

BY JOSEPH SWAN.

THIRD EDITION, CONSIDERABLY ENLARGED.

Servetur ad imum
Qualis ab incepto processerit, et sibi constet.

HOR. DE ARTE POET.

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PREFACE

TO THE THIRD EDITION.

The author would not have reprinted this work, but for the repeated inquiries that have been made for it; consequently, had he any longer withheld it, he might have incurred the imputation of possessing some secret method of conducting his anatomical investigations. It never was his intention to write a complete history of the anatomical arts; therefore such as the following pages are, he freely offers them to the profession, and if they prove useful to a few of those who are pursuing the same path, he shall feel himself amply recompensed. By the close of the present year, he will have nearly completed the works that have so long occupied his attention, and he will then have much satisfaction in showing his apparatus and preparations to those who

are really interested in anatomical inquiries, and giving them such further information as the following pages may have failed to communicate.

There is a considerable difficulty in giving directions for the dissection of the most complicated parts of the nervous system, but these have been attempted in a manner that appeared the best calculated for facilitating the progress of the student, and are published because so little information is given in books on the subject. It must, however, be confessed, that verbal directions alone must be unsatisfactory, but if along with those reference be made to plates, after a perfect knowledge of the bones, and particularly those of the head, has been previously obtained, the dissection will be completed with facility and certainty.

6, *Tavistock Square*,
September 14, 1833.

PREFACE

TO THE SECOND EDITION.

THERE are so many difficulties attending the study of anatomy, that it need not be a matter of wonder that so small a proportion of those who enter upon it attain the object they desire. In almost every other department of science the student is enabled to prosecute his inquiries when and wherever he pleases; but it is not so with anatomy. The difficulties in procuring subjects, and, when procured, the almost equal difficulty of dissecting them, except in public anatomical theatres, form of themselves obstacles that are never experienced in the prosecution of any other studies. When any part of the body has been dissected and all the knowledge possible has been derived from it, the difficulty almost always hitherto experienced in preserving it, so as to convey any adequate idea of what it was in its fresh state, leaves those who

have not the opportunity of frequently repeating the operation, in nearly the same ignorance, as to the positive situation and appearance of its different parts, as before the dissection. This, to those who are always near the public dissecting rooms, may not at first sight appear a matter of so much moment, but to the generality of surgeons, it is one of the greatest that can be imagined, because it is almost next to impossible that, when they have spent all the time allowed for their education, they can ever have the opportunity of referring to fresh subjects to clear up such doubts as it is natural to suppose may frequently arise in the course of surgical practice. Although this, as has been already stated, may not in the same way affect those residing near the public dissecting rooms, yet it must be acknowledged that, if any method could be devised of preserving the dissected parts so as to convey the exact situation and appearance exhibited in a fresh state, it must even to them be a matter of some consequence, as they would thus save the time which the frequent repetition of the same dissection must require.

A greater difficulty has been experienced in making preparations of the minute nerves than of any other part of the body, and for this reason many have been less familiar with the anatomy of the nervous system than of the other parts, and consequently both its

physiology and pathology have remained in much obscurity. Hitherto, after the nerves had been dissected, if it were wished that a re-examination of them should be made, it was necessary to keep them in spirits, for otherwise, after having been dissected a few days, very little could be made out respecting them. But keeping a subject for the nerves in spirits, is not only very expensive, but likewise inconvenient, and after all very unsatisfactory, for whenever there is occasion to examine it, there is much confusion and trouble in searching about for the nerves, besides the risk of destroying many of the small branches. As a remedy for this inconvenience, a method of exhibiting the nerves dry, equally as well as the arteries, detailed in the following pages, will, it is hoped, afford every advantage desirable in making preparations of this system, as by it every dissection of the nerves may be preserved for any length of time in a dry state. Examinations of them may be made at any time, and with the utmost facility, so that every one may easily become familiar with their distribution. It need not be urged how much it must be for the advantage of a student to have a general knowledge of the distribution of the nerves before he begins his dissections, and this he can easily gain by examining dry preparations, where every part is distinct, whilst it would be impossible for him to obtain such knowledge

from a dissection preserved in spirits. With this previous information, and a much less time spent in dissecting than has hitherto been deemed requisite, every one may readily become acquainted with the nervous system, and will moreover be better able to retain the knowledge he has acquired, because, by preserving the parts he has dissected, he will in a few minutes be able to clear up any doubts he may have about their distributions.

This work is the result of many experiments made at a great expense and with much labour : and I am the more inclined to speak with confidence of its probable utility from the very flattering manner in which the Royal College of Surgeons have been pleased to express themselves in the following letter, respecting some of my preparations made according to the rules contained in it, and which were submitted to their judgment for the Jacksonian Prize.

Royal College of Surgeons, 20 *April,* 1820.

Sir,

I have much pleasure in transmitting to you the inclosed, agreeably to the direction of the Board of Curators, and request the favour of your acknowledgment thereof for the information of the Board; and am further directed to inform you that the Board is much gratified with the Preparations received with your Dissertation, and that such Preparations will be carefully preserved in the Museum, as examples of your labour and skill, and mode of preparing and exhibiting parts of animal bodies.

I am, Sir,

Your most obedient Servant,

Edmund Belfour, Secretary.

Mr. Jos. Swan, Lincoln.

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A NEW METHOD

OF

MAKING

Dried Anatomical Preparations.

CHAPTER I.

ON PREVENTING AND PUTTING A STOP TO PUTREFACTION BY OXYMURIATE OF MERCURY.

When most of the arts have made so much progress towards perfection, it is a matter of surprise that Anatomy should not in a greater degree have availed itself of their assistance. Even if the sacrifice of health were of no consideration, it cannot be pleasing to any one to dissect a body during its progress to putrefaction; it cannot be advantageous, because the subject must be abandoned long before the dissection is completed. If a large part is to be dissected with a moderate degree of minuteness, it can only be accomplished by continual application, and then not with

the same distinctness as when putrefaction has been stopped by some chemical process. By unbiassed persons it cannot be questioned but that the same knowledge, acquired by the usual method of dissecting, may be obtained from a much smaller number of subjects, and in a shorter time, when the putrefactive process has by any means been prevented.

The discovery of a method of not only preventing the putrefactive process, but putting a stop to it when far advanced, must be an object of the greatest importance to the practical anatomist, but it must in a still higher degree be valuable to those whose health is so much impaired by putrid effluvia, as to make anatomical investigations a constant source of risk and danger, and, most of all, to those who practise medicine and surgery in hot climates. Under such considerations very numerous experiments have been made, and the results have allowed the formation of such a plan, as will be found productive of every advantage that is possible to be derived from any process for putting a stop to putrefaction.

It was ascertained that a piece of flesh, immersed in a solution of oxymuriate of mercury until it was completely changed, and afterwards put into a large vessel containing cold water for some days, never

became again in the slightest degree putrid, although the greatest part of the oxymuriate of mercury was thus washed away. Numerous dissections were made by putting subjects in the solution in different stages of putrefaction, and always with the effect of arresting its progress, and allowing those to be dissected that would otherwise have been entirely useless.

For the sake of explanation it may be supposed that the skin of a portion of a subject has been removed, and the muscles, &c., separated in some degree, it may be placed in the solution of oxymuriate of mercury for two or three days; or if it be probable that the veins contain much blood, as many of these as possible should be opened, and the subject immersed in water for a few hours, for the purpose of removing the blood before it is put into the solution, as this coagulates the blood, which is then not only troublesome to remove, but produces much discolouration of the surrounding parts. When the subject is taken out of the solution, it should be immersed in cold water for a few hours, both for preserving the instruments and preventing soreness of the hands, but these inconveniences may be obviated by smearing them with a little oil.

It may be observed that a great advantage will be

experienced by this treatment, or even by injecting the solution into the arteries. The subjects will thus undergo very little change for many days, so that each time the dissection is re-commenced, all the parts will be found in the state in which they were left; whereas in the usual way, in one, or at most two days, every thing will be so changed, that there is very little use in reviewing what has been done, and if the dissection is tedious, what was first done can hardly be recognised at the finishing of all the parts. Another advantage is, that the dissection may be carried on in almost any place, and at any season of the year, as every offensive smell is generally entirely prevented.

Supposing the subject to have been immersed in the solution, and that the dissection has again been proceeded with, and it is found that the parts more deeply seated are becoming putrid, it must again be immersed in the solution for two or three days, and then washed with water, and the dissection again persevered in; and the subject must again and again be submitted to the influence of the solution, until it ceases to emit any unpleasant smell. The dissection must be continued, and although many weeks elapse before it is finished, it may only be necessary to cover it with cloths made wet with water, or if it become too dry, to immerse it in water for a few hours or a

few days. It must be observed that if any of the parts, and particularly the fingers and toes, have been allowed to become dry, it is very difficult, if not impossible, to soften them again, so that the hands and feet should be kept continually covered with cloths moistened with water.

When a subject is putrid, and the muscles very large, it is best to inject it with the solution, but this may not sufficiently stop the putrefactive process ; the integuments must be carefully removed, and the muscles separated, and the subject then put into the solution for two or three days, as it has previously been noticed. It may be presumed that leaving the subject a much longer time in the solution will put an entire stop to putrefaction, but this is a great mistake. It becomes necessary to expose and separate partially with the finger the deep parts, as the muscles of the loins, the gluteal and those of the thighs, and those of the neck and scapula, will be entirely destroyed unless the solution be allowed to penetrate them ; and it will be found, to the mortification of the anatomist, if this has not been attended to, that although putrefaction may appear to have stopped, the deep-seated muscles and nerves will be so tender as to be torn in pieces by the slight handling necessary for their separation. When the muscles cannot be well separated,

punctures should be made through the fascia, &c. covering them with a sharp-pointed knife. If putrefaction appears to have stopped, and the subject is put into the solution or water, and if the cavities of the chest, &c. are filled with the fluid, and it does not sink, it may be concluded that putrefaction is still going on in the deep parts, and these will be entirely spoiled if not exposed so as to allow the solution to reach them sufficiently early. The cavities of the chest, &c., and spaces between the muscles, do not at once get filled with the fluid, and therefore by putting the hand into the cavities, or pressing the muscles whilst the subject is immersed in the fluid, the air will escape, and its place become occupied by the fluid, and it will then be properly known whether it be atmospheric air contained in those parts that prevents the sinking, or that arising from putrefaction, and contained in the cellular membrane, &c.

When the body has been thoroughly impregnated with the solution, the flesh assumes a pale appearance, and there is no fœtor arising from it. It is not after this necessary to put it into the solution, but only to keep it covered with wet cloths, whilst it is placed on the table ; and, when becoming too dry, to immerse it in cold water for a day or two, or if it be not wanted, even for several weeks, as no decomposition

will be produced. When it is placed on the table, and covered with wet cloths, it is necessary to observe that the parts are not becoming mouldy, and should spots of this sort be perceived, the cloths should be washed, and the subject immersed in water for a day or two.

It has been observed that the subject must be kept in the solution until any fœtor ceases to arise, but if it has been very putrid, there will be a fetid exudation from the bones, which the solution will not remedy by mere contact, although all the flesh may have been sufficiently impregnated. It is best, therefore, when an adult is chosen, and it is not required to have the minute arteries filled with colouring matter, to inject it with the solution by one of the femoral arteries, as then the contents of the cancellated portions of the bones will become sufficiently changed for preventing decomposition. Or if it be wished to have the arteries minutely injected, white spirit varnish, with the addition of some oil of lavender and vermilion, will tend greatly towards the attainment of the same purpose.

The dissecting table should have round it a ledge of about three quarters of an inch deep, for the purpose of keeping the water from running on the clothes, floor, &c.; but for smaller parts a well-painted tray, or a large earthen dish will suffice.

Both for the purpose of ordinary dissection, as well as for making preparations, every thing used should be clean and free from dust. The tables, trays, &c. ought to be washed always before the subject is placed on them ; and it is more especially necessary to attend to these precautions, for when the subject is wet, it attracts every particle of dust, and by neglect may be entirely spoiled.

For general purposes it is necessary to have a box to measure within, in length six feet four inches, in depth twelve inches, and in width fifteen. It is best to have about nine inches at each end closed, and the lid to be loose and capable of being lifted off; this should be so made that part of the inner edge may go within the box, and a button should be placed at each corner for fastening this down. The box should be strong and well made, for if it is used for alcohol the slightest crevice will produce a very serious loss. When it has remained empty some time, it should be filled with water, for the purpose of trying whether there be any leakage, and if, by repeatedly replenishing it, this does not cease after a few days, the screws or some other parts must be tightened, or made closer.

Metallic vessels should not be used when oxymuriate of mercury has been employed, as this destroys them,

and also produces a permanent discolouration of the preparation.

Another box should be provided for such preparations or finished dissections as are to be kept in proof spirits.

For the purpose of washing the subject after it has been in the solution, a large tub of the same length and width as the box, should be procured and placed under a tap for filling it with water; and for letting this off again, there should be a hole and plug in the bottom.

It may be observed that muriate of soda, nitrate of potash, and other substances, may be used for putting a stop to putrefaction, but none of these answers so well as the oxymuriate of mercury; and if the parts are to be dried, the attraction of moisture from the atmosphere is a serious objection to their employment.

It is not presumed that the plan here proposed, is the only one capable of accomplishing the desired object, but it is the best that has hitherto been had recourse to: doubtless other processes are known to different anatomists, but until these are communicated to the public, or more efficient ones invented, the present may be advantageously employed.

CHAPTER II.

ON PREVENTING OR PUTTING A STOP TO PUTREFACTION BY ALCOHOL.

The use of alcohol is almost entirely forbidden in this country for ordinary dissection by its great expense. But even this cannot be employed without some inconvenience, as headachs, inflamed eyes, &c., and when it is impregnated with putrescent matter, the constant inhalation of the evaporations from it is not without its prejudicial effects; these may nevertheless be obviated in some degree, by immersing the subject in water immediately after removing it from the alcohol. Alcohol having oxymuriate of mercury in solution is still more prejudicial, and ought to be used with the greatest caution.

There is a considerable difference in the effects of alcohol, and the solution of oxymuriate of mercury on animal bodies. The solution produces a contraction of the loose or cellular tissues that never again gives way, except in a slight degree, even after an

immersion in water for many days, so that the nerves and muscles do not become inordinately enlarged, whereas when a subject has been thoroughly saturated with alcohol, and is placed in water, all the cellular tissue becomes distended, and every part assumes a woolly appearance: the muscles and nerves consequently become enlarged beyond their original dimensions. The use of alcohol, therefore, requires more management and trouble than that of the solution; but nevertheless, for the most minute dissections, it is to be preferred, because the terminations of the nerves in particular will admit of separation to a much greater degree of minuteness than the solution will allow.

Common salt does not harden the cellular tissue like the oxymuriate of mercury, and it may be used in the following manner, but only with the view of saving alcohol. Say that a subject has been procured for a dissection of the sympathetic nerve, and the nerves of the abdominal and thoracic viscera. After it has been opened in a manner that will hereafter be explained, and there is a tendency to putrefaction in the muscles, and a very offensive smell in the viscera, if it be at once immersed in alcohol, the whole of this fluid will be spoiled by the admixture of blood and the juices that had penetrated the coats of the viscera, and could

not be washed away with water; therefore, when the cavities have been laid open, and the portions of viscera removed, and the rest cleared of the feculent matter, the subject may be placed in a tub or dish, and covered with common salt, after having had some sprinkled amongst the intestines; the next day more may be added, and as much water as will cover the subject; after one or two days it is to be taken out and washed, and from time to time placed in water. In this manner it may be preserved until the dissection is some way advanced, when it may be advantageously placed in alcohol, and without imparting any thing offensive to this fluid.

CHAPTER III.

OF SOLUTIONS OF OXYMURIATE OF MERCURY.

In using solutions of oxymuriate of mercury for anatomical preparations, it must always be kept in mind that unless animal substances are entirely changed, it must not be expected they will either be preserved from putrefaction or retain the properties of preparations made according to the rules which will be laid down. When this solution was first used for preparations, the animal bodies were not submitted to its influence for more than a few days; and the consequence was, that when they had been kept for some time in a damp place, all the deeper seated parts emitted an offensive smell, or became mouldy, and had a very different appearance from the superficial ones.

Solution of Oxymuriate of Mercury in Water.

Take of oxymuriate of mercury, one ounce.
Muriate of ammonia, thirty-five grains.
Water, one pint.

The oxymuriate of mercury and muriate of ammonia must be rubbed together in a mortar, and then the water must be added gradually until the solution is complete.

Though this solution no longer contains oxymuriate of mercury in the same state as when dissolved in alcohol, yet it has the effect of hardening animal bodies in the same manner.

I have supposed that preparations made with this solution might be more liable to be affected by damp air on account of the addition of muriate of ammonia, but from the appearance of those made several years ago it is not probable that any injury of this sort will be sustained.

A white precipitate is thrown down during the time an animal body is immersed in it, and should occasionally be removed, for if it be suffered to collect at the bottom of the box it prevents the free access of the solution to the subject, and then the necessary changes are not so well accomplished.

For the ordinary purposes of dissection a solution of oxymuriate of mercury of half the preceding strength will be sufficient, as it will arrest the putrefactive

process; but it is necessary that the muscles should be hardened as quickly as possible by the stronger solution, for preventing their shrinking when made into dry preparations.

Solution of Oxymuriate of Mercury in Alcohol.

Dissolve two ounces of oxymuriate of mercury in sixteen ounces of alcohol. This solution has been found to answer some purposes better than that made with water, as in the hardening of brains; but for common preparations of the whole body or its extremities it is not necessary. It is, however, best for injecting the arteries of a putrid subject, and particularly if this state is far advanced. It cannot, however, be denied that the preparations made with this are, in some respects, superior to those made with the solution in water, but not in that degree to compensate for the great additional expense.

CHAPTER IV.

ON THE ADVANTAGES OF A NEW METHOD OF MAKING DRIED ANATOMICAL PREPARATIONS.

Every one who has paid attention to anatomy, whilst he has been convinced of the utility of dried preparations, must have regretted the difficulty of preserving parts, after much time and expense have been employed in dissecting them. The plan detailed in the following pages will not only prevent many of the usual disappointments of the anatomist in this respect, but add many advantages which dried preparations never before possessed. These advantages are :

1st. That the muscles do not shrink so much as they do in the usual method.

2nd. The tendinous parts are preserved distinct from the fleshy, so that the muscles have nearly the same appearances as when first dissected.

3rd. The disparity in the bulk of the muscles and injected blood-vessels is so far diminished that the surgeon may form a better idea of those important parts, the arteries.

4th. The nerves are also well preserved in their usual situation. And thus the muscles, arteries, veins, and nerves are exhibited in the places which they naturally occupy.

5th. The most minute nerves may be preserved dry equally as well as the small arteries; thus affording a much easier method of obtaining a complete knowledge of the nervous system than can be acquired in any other manner.

6th. Preparations thus made will keep in any climate, heat affects them but little; so that they may be preserved in the hot climates of our colonies, as in the East or West Indies.

7th. A damp air does not destroy them, or hardly at all affect their appearance.

8th. They are not offensive to the smell, and may consequently be preserved in situations where other preparations could not be borne.

9th. Insects will not touch them, so that they are not liable to the sure destruction of preparations made in the ordinary methods.

10th. A putrefactive state of the body, although existing to such a degree as to render it extremely offensive, does not prevent such subjects from forming good preparations ; the putrefaction is checked by the substances employed in preparing them, and is not afterwards liable to return.

11th. They dry rapidly, and whilst drying flies and other insects avoid them.

CHAPTER V.

ON THE PREPARATION OF AN ARM, AS A GENERAL ILLUSTRATION OF A NEW METHOD OF MAKING DRIED ANATOMICAL PREPARATIONS.

A LIMB being chosen as free from fat as possible, a solution of two ounces of oxymuriate of mercury in half a pint of rectified spirit of wine, is to be injected into the arteries; and the next day as much as possible of white spirit varnish, to which one fifth part of turpentine varnish has been added, and some vermilion: the limb is then to be put into hot water, where it is to remain until properly heated, when the coarse injection is to be thrown into the arteries and veins, if required. If the veins are to be injected, it is better to wash the blood out of them with water before the solution of oxymuriate of mercury is thrown into the arteries, as some of this will return by the veins, and coagulate the blood contained in them, so as to prevent the injection from passing into the smaller branches.

After the limb has been injected, it is to be dissected. Every time it is left, and even sometimes during the dissection, it is advisable to cover those parts which have been exposed with a cloth made damp with water. If from change of weather or other circumstances it has become suddenly putrid, and it is probable the time required for finishing the dissection will be so long as to lead to a supposition that many of the parts will be destroyed before this can be accomplished, it may be immersed in the solution for a day or two, according to the directions for stopping putrefaction.

It is necessary that the dissection should be conducted in a different manner from that frequently adopted for making preparations, by exposing the blood vessels at the expense of every other part, but preparations made according to the directions hereinafter detailed will most commonly be good or otherwise in proportion to the pains that have been taken in the dissection. All the fat and cellular membrane should be removed. The muscles*, tendons, arteries, veins, nerves, and ligaments, which it is intended to exhibit

* The different portions of each muscle, as far as they are connected by cellular membrane only, should always be separated except when the surrounding parts will be injured by so doing.

distinctly in a dry preparation, must be made distinct before any attempts are made to dry it.

It must always be recollected that this method of making preparations is entirely different from that generally adopted. For in this, after the dissected parts have been subjected to the influence of the solution of oxymuriate of mercury, the moisture contained in them is merely dissipated whilst they are drying, and no ulterior changes take place during this process, so that every part that has been left will remain; whereas in the old method, not only during the time of drying, but long after the dissection has been completed, the putrefactive process still goes on in some degree, so that portions of cellular membrane, &c., that have been left, become so much decomposed as to be in a great measure easily removed by washing.

If the directions that have been given are attended to, it will be easy to make the limb into a dry preparation; but if, on the contrary, these are neglected, it will be found tedious and difficult, and the method itself will be condemned, when the fault is wholly attributable to the slovenly mode of dissecting.

After the dissection is finished, the limb must be immersed in the solution of oxymuriate of mercury

for a fortnight, but the longer the better, and especially if the subject has been very putrid. The time it is in the solution must always be reckoned from the finishing of the dissection.

Much trouble will be saved by having the dissection entirely finished before the limb is put into the solution, as it will not then be necessary to take it completely out of the box, but only to turn it over, and this should always be done several times, if the dissection has not been of such a nature as to incur any risk of its being injured thereby, or otherwise, when the limb is large, the part at the bottom will frequently lie so close to the box as to prevent the solution from getting to it.

Every thing used must be clean and free from dust, and this precaution ought most especially to be attended to after the limb has been in the solution, as it then so readily attracts every particle of dirt, and by neglecting this a preparation may be entirely spoiled.

When the limb has been long enough in the solution, it is to be taken out and immersed in water for twenty-four hours, for the purpose of washing away any superabundant quantity of the oxymuriate which otherwise crystallises on the preparation and forms a white covering, which spoils its appearance, and it is

very difficult if not impossible to remove this, for if it be covered with varnish many different times the crystals will still penetrate it.

When it is removed from the water it is to be suspended in order to be varnished and painted; for the convenience of which, a piece of wood about a foot and a half long and three inches broad should be nailed to each end of a table or board. Near the top of each piece of wood there is to be a hole for a wooden screw, which should be half an inch in diameter, and six inches long. A hole is to be made through the end of each screw to admit strings, by which the scapula may be tied at one end, and the hand at the other. The best way of fixing the hand is by a bit of wood four inches long and half an inch thick, through which eight holes should be made at about a third of an inch from each other; then a piece of string is to be passed through the tip of each finger, and each end of the string through one of the holes, by which means all the fingers will be tied to the wood. Another hole is to be made near the middle of the wood, by which it is to be tied to the screw. When the limb is suspended it is to be wiped with a piece of clean linen, and a small bit of wood should be put between the tendons of the perforated and perforating muscles near the wrist, and then the nerves, tendons, and tendinous expansions

must be done over with mastich varnish, on this and the three succeeding days. The nerves must be painted as often as appears necessary with the white paint and drying oil. Care must be taken to paint the under surface of the nerves, as well as that which is superficial, if it can be done without much inconvenience.

In several preparations no paint has been used for the tendons, and these preserved their character in a considerable degree, and it is therefore better not to do more than varnish them until the preparation is quite finished, and it may then be determined whether the paint will improve their appearance.

Several of the tendons would look very well without paint, but in drying they do not all preserve the same appearance, and some of them assume a very dark colour, and particularly their tendinous parts or fasciæ connected with muscles, it was therefore thought necessary to paint these expansions as well as the tendons, and thus keep a uniform appearance. To accomplish this object by other means, a great variety of different trials was made with varnishes, but as the results were unsatisfactory, others were made by adding paints to the varnishes, both with a view of rendering the process as simple as possible, as well as retaining the most natural appearances; and the rules laid down for

preserving these parts are founded on those experiments which seemed to answer both these intentions the most decidedly.

As soon as the muscles have become stiff or dry, they may be painted; in doing which much care is necessary to be taken that the tendons and nerves are not touched, and this may be avoided when they are very near the muscles, by interposing small pieces of wood.

For giving the natural appearance to the muscles water colours may be used, by mixing together a little lake and vermilion on a palette, as in the usual way of painting. It is desirable not to have the colour too deep.

As by this mode of making preparations the parts very soon become stiff, and must then remain in the same position they have acquired, it is necessary at first, or at furthest within the first two or three days, to put every part in the exact place it is intended it should keep, and with this view it is proper to observe occasionally the progress of the preparation, until the parts have become so hard as to preserve by themselves their proper situation. Although a preparation may not frequently be spoiled by leaving the parts to dry in the situations they first acquired after being suspended, yet much may be added to the appearance by attending to this seemingly trifling circumstance; for instance in the

deltoid muscle, as in the position it will in all probability acquire if left to itself, it will dry flat, or in wrinkles, whereas by just putting a finger behind it, and pressing it outwards when it is becoming stiff, it will preserve the rounded form it naturally has, and will thus appear to much greater advantage.

In other parts of the body, and especially in animals where the muscles are large, it may be necessary to separate some of the parts by pieces of wood, or by a string fixed to a particular part to which a small weight can be suspended, or in any other more convenient manner.

About a month after it has been taken out of the solution, those nerves and tendons that are not sufficiently painted should be covered with the paint and varnish as before as many times as are thought necessary; but one day should intervene between each time of doing them; at the same time parts of the muscles will appear that have not been painted, which may now be done. But it is better to wait some time longer, and then to paint any parts of the muscles that may require it, or to leave the painting of the muscles altogether until the parts have become dry. When the preparation is perfectly dry, the whole must be varnished two or three times with the white spirit varnish. After this it will have its perfect appearance,

but to make it more durable and likewise capable of being washed, it should be varnished with the best copal varnish, two or three times, with an interval of a few days between each time of using the varnish.

In using the varnishes care should be taken that too much is not laid on at one time, as in that case it either settles in drops on the preparation, or joins parts together which ought to appear separate, and makes the whole appear confused. In varnishing, it is necessary to finish the part immediately when it is once begun, for if any delay takes place, and a brush is drawn over a part a few minutes or even a few seconds after the varnish has been first applied to it, the appearance is very much altered.

After being subjected to the influence of the oxymuriate of mercury, the coats of the arteries and veins do not become transparent so as to show the colour of the injection, and therefore it is requisite that these vessels should be painted with vermilion mixed with water, but if this will not adhere, with the same colour mixed with drying oil for the arteries, and Prussian blue for the veins.

The method pointed out for suspending the limb is the most convenient, but when the anatomist has not

sufficient room it may be done by fixing a string on the scapula, and tying it to a staple or any thing else fastened on a wall, where it may remain until it is finished.

Though a preparation will seldom be greasy if due care has been taken to remove all the fat, yet this will sometimes be the case. And the best method of cleaning it in such a state, and of preventing a further exudation of grease, will be to rub it as clean as possible with a piece of soft rag, and then to wash it well with the solution of acetate of lead, which should the next day be applied by means of a brush, and, when perfectly dry, repeated in the same manner several times, after which the part must be covered three or four times with white spirit varnish.

The preceding method of making preparations imparts all the advantages detailed in the introduction, but if the shrinking of the muscles be not an object, much trouble will be saved by having a limb injected in the common way, first with a little varnish and red lead, and then with coarse injection: and, indeed, when it is wished to make a preparation of the minute arteries, the usual method will be found the best, because after the solution of oxymuriate of mercury has first been injected, the coarse injection will not generally fill the vessels so well as will thus be required.

CHAPTER VI.

ON PREPARATIONS OF THE MINUTE NERVES.

It is supposed by many that young children are better subjects for dissections of the nerves than those of more advanced age, but this is a great mistake. In a child the nerves are certainly larger in proportion to the other parts than in the adult, and the larger nerves may be conveniently enough dissected in them, but it is not so with the more minute branches.

Even in a very thin child so much fat is always found in different parts, as to make the dissection very tedious, besides the nerves have not appeared so strong as in the adult, so that much disappointment has been occasioned by their frequent breaking.

The minute nerves of the face and neck are generally the largest and most distinct in the male, and one should be chosen who has been originally strong and well made, between twenty and fifty years old, and as free from fat as possible. The nerves are almost invariably found more delicate in the female than in the male, and in very advanced age so much so as to be totally unfit for dissection.

Although it may not be in the power of the anatomist to choose such a subject as he desires, yet for a dissection of the sympathetic nerve and par vagum one emaciated, but not destroyed by a disease of the lungs, is to be preferred; for it generally happens in cases of this sort, that besides the disease of these viscera, all the absorbent glands and vessels of the neck and thorax are so much enlarged, and there is frequently such a thickening of the parts at the bottom of the neck, as to create a degree of confusion, which renders the dissection of the sympathetic nerve and par vagum sometimes unsatisfactory.

What has been said about the choice of human subjects, as far as respects the age, does not apply in the same manner to animals, for in many of these, and especially the larger ones, the nerves in general are never so conveniently dissected as they are within a week or two after birth, because at that age they are generally more free from fat in every part than at any later period, as it is so difficult to procure such as have been in a diseased state long enough for all the fat to have been absorbed.

It is better to separate most of the nerves from the fat before attempts are made to remove much of it, but in hot weather it becomes very soft, so that much of it may be absorbed by blotting paper, and then the remaining

membrane that inclosed it can be separated without much difficulty or the risk of destroying the minute branches of skin on the tip of the nose andmargin of the lips.

In dissecting the nerves of the neck, and indeed those that are minute in every other part of the body, the scalpel must be very little used, except for removing the skin ; for when the nervous branches are very numerous, it is next to impossible to separate them from the surrounding parts with an instrument of this kind, let the care and knowledge of the anatomist be ever so great. In a general way, the most convenient instrument will be one similar to a separate blade of a pair of scissors, made to cut like a knife, which may be procured at Mr. Laundy's, St. Thomas's Street, Southwark.

The student is not to cut straight forward when he is following a nerve, but he must take hold of the trunk, and separate it from the surrounding parts rather by poking and tearing away these than by cutting, although he may frequently use the cutting edge advantageously when he can see that he shall do no mischief. The instrument should generally be used by keeping the back of it to the subject, and directing the point to enter the part obliquely downwards, so that in cutting forwards he will only divide the parts lying over the nerve ; these divisions should be made by frequent short cuts, for as a nerve or a

branch keeps dividing into others, if a long cut be made, either some of the branches will be divided, or others communicating with them. If he attempt to follow the nerves with the cutting edge towards the subject, he will very often be disappointed by dividing the nerves and blood-vessels ; but his own experience will soon convince him of the best method of using his instruments.

If the part is to be dried, every portion of fat must be removed, for if it be not, it will sooner or later show itself in the preparation by its transudation, which softens any varnish that may have been applied and not only renders the preparation unpleasant by its sticking to the fingers whenever it is taken hold of, but also causes it to attract every portion of dust, so as in point of fact to take very much both from its appearance and utility.

It is farther necessary to remove every portion of cellular membrane from the nerves, that they may be as distinct as possible, otherwise where there are many minute branches in a small space, they will have such a confused appearance as to defeat the main purposes for which the preparations are made.

Whilst prosecuting the dissection, it is desirable that the part should be kept in spirits, if it be probable that it will be long before it can be finished ; but at

all events the minute nerves should be moistened from time to time with spirit of wine or water, as otherwise if suffered to get very dry they will be very liable to break.

For making a preparation of the minute nerves, and for illustration, the sympathetic should be chosen. The integuments should be removed, and such other portions as are not required; the muscles, arteries, nerves, &c., are then to be carefully and partially separated, and the subject immersed in cold water for twenty-four hours; the nerves thus become larger, stronger, and more distinct. The dissection must then be proceeded with for some days, when the parts are to be immersed in alcohol, or salt may be used first, according to some preceding directions; for if a subject be kept in water too long, the nerves become enlarged, and the cellular membrane attached to them swollen out, but by putting it into alcohol they are contracted again to their natural dimensions. On taking the subject out of the alcohol, the nerves dry so fast and contract so much, as to make it absolutely necessary to have the parts not under dissection covered with a wet cloth, and the subject placed in cold water for a few hours once in every four or five days. It is thus by alternating the use of the water and alcohol, that the subject is kept in the most proper state for dissection. When the dissection is finished, about two

thirds of alcohol and one of water best preserve the natural size of the nerves.

In making a good dissection, the student must give it his unwearied attention for many weeks, as he may by any hurry or carelessness for one moment divide the minute communications with other nerves, and all at once be involved in an inextricable labyrinth, and as so much time must be spent in the dissection, as would prevent the completion of the preparation before the natural changes of the subject have destroyed the appearance and texture of the different parts, there is no other way in which he can proceed so satisfactorily as by means of the pointed instrument like a single blade of scissors, and the use of water and alcohol alternately; and if this method is pursued, which appears to me the only one by which a complete and satisfactory preparation can be made, the student will seldom be disappointed in making such dissections as will enable him to comprehend thoroughly the most difficult and intricate distributions and combinations of the nerves.

In a general way, for preparations of the nerves, it is better not to inject the subject with minute injection for the preservation of the size of the muscles, for if the first object is the demonstration of the nerves, they will appear to greater advantage by the shrinking of the muscles.

CHAPTER VII.

DRY PREPARATIONS OF THE MINUTE NERVES.

When all the nerves intended to be exhibited in the preparation have been sufficiently dissected, the part is to be immersed in the solution of oxymuriate of mercury, as has been described in the general illustration, and it must remain there a sufficient time. In a general way a fortnight will be sufficient, but if the part is very bulky and the muscles have not been much separated, a longer time must be allowed, as in this instance the deep-seated parts will not so soon imbibe the necessary influence of the solution.

When the part is taken out of the solution, a string of sufficient length should be fixed to some part of it, by which it is to be suspended to some convenient place on a wall, or in any other way that may be thought preferable. The next day the nerves must be separated from each other with the forceps, and then covered with mastich varnish; immediately after which the nerves must again be separated from each

other with the forceps. All the tendinous parts must at the same time be varnished as is required for other preparations, which must be done according to the directions given in the general illustration for the preparations of tendons.

The following day the same process of varnishing and separating the nerves must be repeated. Using the varnish twice is generally sufficient for the minute branches, but the process of separating them must be daily repeated, until they are so dry as to keep the situations they were placed in. If more varnish is required than has been used, it will be known by the nerves not shining as things always do that are saturated with varnish; on the contrary, if too much is used, the branches will not easily be kept sufficiently apart to be distinct, especially where they form a network.

In about a week the nerves will be sufficiently dry for being painted, but this process may be deferred for any length of time to suit the convenience of the anatomist. White paint, with a little drying oil, must be used, as often as may seem necessary, but twice for the smallest branches will in general be sufficient. It should be used with small brushes when the finer branches are painted, with very little paint in the

brush at one time, otherwise it settles in drops on the nerves, producing adhesions or a knotted appearance, or fills up the meshes formed by different branches, and thus constitutes a confused mass. In some situations it is necessary to interpose some very small bits of wood to keep the branches asunder until the preparation is entirely finished.

The muscles when dry must be painted red, with water colours; and when the paint is dry, the whole preparation must be varnished, two or three times, with white spirit varnish and the best copal varnish.

In making preparations of the cutaneous nerves of the arm, it is a great advantage to have both the arteries and veins first filled with coarse injection, as these nerves are confined to their exact situations by the veins.

It may be thought, from the number of directions detailed in the foregoing pages, that the making of dry preparations of the nerves is very laborious, and takes up a great deal of time, but it can be safely asserted, that when the dissection has been well performed, a preparation may be completed with very little trouble.

CHAPTER VIII.

PREPARATIONS OF THE BRAIN.

Having removed the top of the skull, divide the dura mater over each hemisphere, detach the greater falx from the crista galli, and raise the posterior lobes of the brain a little, and divide the tentorium: then raise the anterior portion of the brain, and separate the nerves in succession, but leave them sufficiently long, and divide the spinal marrow as low as possible. Place the brain with its base upwards on a plate, and carefully remove the arachnoid membrane, the pia mater, and the vessels. Great care is required in doing this, near the origins of the nerves, as these become separated from the brain by the least rudeness. It may be necessary to place it in water for a few minutes, or an hour or two, as the vessels and membranes, when too dry, cannot easily be separated. After the removal of the membranes, it is to be placed in alcohol, and turned over at first twice every day, otherwise the part on which it rests lies so close to the

bottom of the vessel that the alcohol cannot have access to it, and is therefore apt to become soft.

If the brain is to be dried after the removal of the membranes, it should remain immersed in the solution of oxymuriate of mercury in alcohol a month; but if it should be small, as that of a sheep, a fortnight will be long enough.

When it is taken out of the solution for the purpose of drying, it should be covered once with mastich varnish; it must then be put on a clean plate, and have its position changed two or three times in the twenty-four hours for the first few days, otherwise the pressure on the flat surface of the plate will totally efface any of the eminences that have been in contact with it too long.

When it is perfectly dry it must be painted with white paint, mixed with as much mastich varnish as will give it the consistence of cream, as often as is required for restoring its natural appearance. When this has been done it should be covered with mastich varnish, to which a very small quantity of paint has been added. Care must be taken that the painted surface is perfectly dry before another application is made.

After it has been sufficiently painted it must be varnished with the white spirit varnish two or three times. As it is impossible to suspend it for this purpose, the upper surface must be varnished and suffered to dry; it must then be turned over, so that the varnish may be applied to the part that was in contact with the plate. Every time the varnish is used it is necessary to have very little in the brush, which should only just touch each part once. Without this precaution the paint will be disturbed, and the proper appearance of the brain destroyed.

In the same manner both the brain and spinal chord may be preserved in their natural situations in preparations for showing the origins of the nerves. Many experiments have been made to dry the brain, so as to prevent its shrinking, by first boiling it in different varnishes, but none of these answered so well as the foregoing process; but of the varnishes used, the mastich appeared to penetrate the deepest.

When the brain has been removed it will be best to make a preparation of the base of the skull, for showing the course of the nerves through the different foramina. The nerves on one side, and the parts surrounding them, should not be touched. On the other side the upper margin of the superior lacerated

orbital foramen should be cut away; and the third, fourth, and first trunk of the fifth and the sixth nerves should be traced to the orbit; the fifth should be traced to the Gasserian ganglion, and the second trunk to the round foramen, and the third to the oval one. The bone of the upper part of the internal auditory meatus should be cut away, and the auditory and facial nerves shown. The superior branch of the Vidian nerve should be exposed by removing the dura mater, on the outer surface of the petrous portion of the temporal bone, where it will be seen entering the aqueduct of Fallopius to join the facial nerve. By removing the inferior part of the lateral sinus, the glosso-pharyngeal, the par vagum, and the accessory, will be also seen; but it is still better to remove such a portion of the occipital bone as will open into the great foramen, care being taken not to destroy the ninth pair.

CHAPTER IX.

PREPARATIONS OF THE SPINAL CHORD AND ITS NERVES.

Posterior Surface.

For making a preparation of the posterior surface of the spinal chord and its nerves, the subject should be placed so that the head may hang over the edge of the table. An incision should be made through the integuments, from the back of the head to the extremity of the sacrum ; the muscles on each side of the spinous processes should be then separated and partly removed. The spinous processes should next be cut off at their bases with a chisel, or sawn through from either side. The canal must then be freely opened by cutting through the base of each spinous process with a chisel, or a pair of strong cutting forceps. After this, the sheath formed by the dura mater should be opened, care being taken to avoid cutting the nerves which have escaped from it, by holding up its edge with the forceps and separating with the pointed instrument any fat and cellular membrane surrounding the nerves.

The exact situation of the ganglia will thus be known and avoided in removing other portions of bone.

If it be wished to save all the branches of the posterior trunks of the spinal nerves, the muscles must be only divided on each side of the spinous processes, and no portion of them removed except in tracing the branches of nerves to their terminations.

If the sympathetic nerve is to be preserved for showing its exact situation, with respect to the ganglia of the spinal nerves, or for tracing its connection with them, the sternum should be divided perpendicularly through its middle, and the ribs of the right side at their angles; so that the right half of the sternum with the anterior portions of the ribs attached to it may be entirely removed; the abdomen should also be opened by an incision between the straight muscles, and the viscera of the chest and abdomen taken out; the sympathetic and its connexions with the spinal nerves should then be dissected, so that when the spinal canal has been opened at its posterior part according to the preceding directions, the remaining portions of the ribs of this side may be easily removed. The left side may remain as it was, and the branches of the posterior trunks be dissected to their termi-

nations. For showing the posterior sacral branches more care is necessary in opening the canal of the sacrum; the bone as far as the middle of the foramina should only be cut away at first, as each posterior branch passes immediately from the outer extremity of its ganglion, through its foramen.

For demonstrating perfectly the spinal chord, after the spinal canal has been opened, the vertex should be removed; also a large portion of the occipital bone, the saw being directed obliquely downwards towards he spinal canal on each side; and when the bone has been divided almost close to the large foramen, it will be better to separate the remaining part with the bone forceps, or a chisel. The greater part of the brain may then be removed, and also a portion of each side of the cerebellum, as their great weight will otherwise break through the connections of the nerves.

Anterior Surface.

For making a preparation of the anterior portion of the spinal chord and its nerves, the sternum should be divided perpendicularly through the middle and the ribs of the right side through their angles, so that the anterior portions may be taken away. The viscera of the thorax and abdomen should be removed, except the fundus of the bladder, and a small portion

of the rectum. The dorsal nerves should be sufficiently separated near the angles of the ribs on the left side, for allowing these to be divided with the bone scissors, so that the cut ends may be of nearly the same length, and thus have a neat and even appearance when the sternum is thrown back. The bodies of the vertebræ will now be fully exposed, and portions of these may be removed by a saw so as not to penetrate the spinal canal. The nerves on each side, just on emerging from the canal, should be separated, and then the remaining portions of the bodies removed by the cutting forceps, or a chisel. The canal being opened, the dura mater may be divided, and the anterior bundles of nerves traced over the ganglia to join the posterior just at the termination of the ganglia. The remaining parts of the ribs of the right side may be removed, and the posterior branches of the nerves traced to the muscles and integuments. The symphysis of the pubes should be divided, and the right ilium disjointed from the sacrum, but, previously, the crus of the penis should be detached by carrying the knife so close to the bone of the pubes and ischium, that the internal pudendal nerve may not be injured. The anterior branches of the spinal nerves may be traced from the ganglia of the left side of the spinal chord, to their terminations. For the purpose of seeing particularly

the connection of the anterior part of the spinal chord with the brain, the vertex and the portions of the hemispheres should be removed, and then the anterior portion of the skull sawn off, so as just to leave the large foramen perfect; the margin of this may afterwards be divided, when the continuation of the spinal chord and the oblong medulla will be seen. As much of the brain as possible should be removed, for the reasons given in the directions for opening the spinal canal at its posterior part.

In drying the preparations of the spinal chord, particular attention is required for making the nerves assume their proper position, by pressing them out with the point either of a pair of scissors, or forceps.

CHAPTER X.

PREPARATIONS OF THE OLFACTORY NERVES.

Make a perpendicular section through the nose close to the right side of the septum; then detach the septum from the Schneiderian membrane covering its left side, by just breaking through a portion of the septum with the bone nippers, and then separating the bone from the membrane by the handle of a small knife, cut it away with the bone nippers quite up to the ethmoid bone, when filaments of the olfactory nerve will be seen on the portion of membrane to which the bone adhered. It is only in some preparations that the nerves can be observed distinctly at the inferior part of the membrane.

For having a view of the nerves passing on the membrane covering the turbinated bones, saw through the orbit and the antrum perpendicularly, and then, after breaking through a portion of the bone, and separating the membrane with the handle of a knife, carefully remove all the bone forming the

exterior boundary of the nose, and as much of the turbinated bones as can be done easily; some of the filaments will be seen on the anterior portions of the membrane, and several others passing on it at the posterior angle of the superior turbinated bone and communicating with filaments from the spheno-palatine ganglion.

For preparations of the spheno-palatine ganglion, and its nasal and palatine branches, the nose must be divided as for those of the olfactory nerves; but the teeth and soft palate must be preserved. These preparations to show the nerves must be kept in spirits.

Dissections for dry preparations of the nose, mouth, larynx, &c. should be put into the solution of oxymuriate of mercury for some time, for effectually preserving them from the ravages of insects; and must then be dried, painted, and varnished so far as to restore their original appearances.

CHAPTER XI.

PREPARATIONS OF THE EAR AND THE AUDITORY NERVE.

It will be necessary to enter further into an anatomical description of the organ of hearing in the present chapter than was intended in any part of this work, as it is almost impossible for those unacquainted with its structure to make good preparations without a previous knowledge of the relative situations of its most intricate parts.

When the top of a skull has been sawn off, and the lower jaw removed, the base may be turned upwards and divided lengthwise, by carrying the saw through the middle of the palate and the great foramen. The bone forming the inferior part of each external auditory meatus must be laid bare, and carefully removed with a chisel and mallet, until the membrane of the tympanum is fully exposed. In one of these portions the extremity of the Eustachian tube must be detached from the pharynx, and turned a little aside; the anterior part of the skull must then be removed by

sawing through the glenoid cavity, so as to leave the membrane of the tympanum and Eustachian tube perfect. In this portion the cavity of the tympanum may be laid open, by cutting away with a strong knife or chisel a thin piece of bone which is at the side, and opposite the middle of the petrous portion of the temporal bone, and between its sharp edge and the squamous portion, which will expose the hammer and anvil. Then the Eustachian tube must be cut open quite into the tympanum. In this dissection, the tympanum will be seen communicating backwards with the mastoid cells, and at the same time the situations of the four small bones must be observed: that the hammer is fixed by its handle to the membrane of the tympanum, and that its slender process is articulated in a groove at the anterior part of the tympanum: that the body of the anvil is articulated with the head of the hammer, that its short leg is resting in a groove in the bone near the entrance of the mastoid cells, and after a little of the petrous portion, opposite to the anvil, has been cut away, that its long leg is joined to the very small orbicular bone: that the stirrup goes across the tympanum, its head being articulated with the orbicular bone, and its base with the oval fenestra. To have these bones separate, and at the same time perfect, it is necessary to macerate a temporal bone

until they are quite loose. In a similar portion of the skull the muscles of the tympanum must also be dissected.

Each auricle should be left perfect by beginning to open the external auditory meatus, where the concha terminates. All the skin may be removed that surrounds it, and likewise all the flesh from every part of the skull, care being taken to leave the Eustachian tubes perfect.

These parts may be thus made into preparations. One half of the skull may show the Eustachian tube entire, and its exact situation in the pharynx; the other may show it cut open into the tympanum. If it is wished to show the semicircular canals and cochlea in one of these preparations, it may be done; otherwise both parts may be put into the solution of oxymuriate of mercury for some time. When taken out to dry, a bit of wood or quill should be put into the Eustachian tubes, that they may dry open. The soft parts may be covered once with mastich varnish, and when dry the muscular parts, &c. may be coloured if necessary. When the whole is perfectly dry, it may be varnished twice with copal varnish.

Before beginning the dissection of the labyrinth, it

will be necessary, in a macerated temporal bone, to saw off the squamous portion just at the superior part of the external auditory meatus; and then to lay open this and the tympanum, by detaching a piece of bone with a saw, which is first to be directed from the inferior part of the external auditory meatus, between the styloid process and the stylo-mastoid foramen into the inferior extremity, or beginning of the carotic canal, and then from the superior part of the external auditory meatus, into the superior part of the carotic canal.

In the bone thus prepared, on the outside of the petrous portion, and about its middle, within the cavity of the tympanum, the oval fenestra to which the stirrup is fixed will be observed, and immediately below this a projection of the bone called promontory, and at the under part of this the round fenestra which is about one twelfth of an inch below the oval fenestra, and which in a recent bone is closed by a membrane; behind the round fenestra may be seen a hollow, which is the cavern from which the muscle of the stirrup originates.

On the posterior or inner surface of the petrous portion may be observed the internal auditory meatus, the bottom of which is divided into two hollows by a sharp ridge. The fore-part of the inferior hollow is

perforated by many minute holes, through which the branches of the nerve go to the cochlea, and in the back part of this hollow are several holes, through which the branches of the auditory nerve go to the vestibule and semicircular canals. In the superior hollow are two holes, the lower or smaller one for the transmission of branches of nerves into the vestibule, the upper or larger one for the transmission of the facial nerve, which may now be traced through its extent; it goes from the internal auditory meatus, between the cochlea and outer extremity of the superior semicircular canal, it then passes over the superior edge of the oval fenestra, and then backwards and downwards, and terminates at the stylo-mastoid foramen. The bone thus dissected may be kept to show the parts that have been already described, or those of the labyrinth may be exposed in it.

For making a preparation of the labyrinth, it is necessary to begin to file about the middle of the petrous portion of the temporal bone, and between its ridge and the cavity of the tympanum, and the superior semicircular canal will be opened, and by tracing it towards the tympanum, will be found terminating in the vestibule, nearly opposite to the head of the hammer; the other extremity will be found terminating in common with the upper extremity of the posterior semicircular

canal, which termination is about three twelfths of an inch from the middle of the posterior part of the internal auditory meatus, and in the fœtus two twelfths.

In tracing the posterior canal backwards, its inferior extremity will be found at about three and a half twelfths of an inch from the jugular fossa, and in the fœtus rather more than two twelfths of an inch from the stylo-mastoid foramen.

These two canals being laid open, the petrous portion behind them must be cut away until the exterior semicircular canal is opened. It is placed horizontally about four twelfths of an inch deeper in the bone than the top of the superior canal, and is nearly even with the superior part of the anvil. In the fœtus it is three twelfths of an inch deeper in the bone than the top of the superior canal. The labyrinth is most easily dissected in the fœtus, for it is as perfect as in the adult, whilst the surrounding bone is so soft as to be very easily cut with a knife, but the adult's ear makes the most beautiful preparation. In the fœtus the course of a great part of the superior and posterior semicircular canals may be seen without any dissection.

The cochlea is now to be dissected. It lies with its base to the internal auditory meatus, and its point to

the tympanum. It is three twelfths of an inch from the entrance of the outer extremity of the superior semicircular canal into the vestibule; in the fœtus it is two twelfths of an inch. It must be opened by carefully cutting away the bone with a knife, the point being inclined a little downwards towards the tympanum. When the cochlea is laid open, something like a pillar in the middle, going from the base to the apex, may be observed; the lower two thirds of which have been called modiolus, and the upper third infundibulum. The spiral lamina, which is a thin plate of bone with a membranous edge, winds round the pillar; it begins at the round fenestra, and divides the cochlea into two canals called scalæ, these two canals communicate at the apex where the spiral lamina terminates in a sharp point.

To have a more perfect knowledge of the labyrinth it will be necessary to separate the petrous portion from the rest of the temporal bone; the remaining part of the shell of the cochlea must then be carefully removed so as to expose the whole spiral lamina, when it may be observed that one of the canals called scala tympani terminates at the round foramen, and the other called scala vestibuli, at the vestibule. The vestibule may be laid open either by filing away the bone between the internal auditory meatus, and the common termination

of the superior and posterior semicircular canals, or by cutting away the bit of bone between the oval and round fenestræ.

There are two canals mistakenly called aqueducts, one leading from the vestibule called aqueduct of the vestibule, and the other from the cochlea called aqueduct of the cochlea. Both of the aqueducts may be seen in that preparation, where the vestibule has been laid open by cutting away the bone between the oval and round fenestræ. The aqueduct of the vestibule may be seen beginning just opposite the opening made in the vestibule, and just below the common termination of the superior and posterior semicircular canals. It terminates at a hole on the posterior or inner surface of the petrous portion three twelfths of an inch behind the internal auditory meatus.

The aqueduct of the cochlea may be seen in the same preparation beginning at the under part of the scala of the tympanum, very near the round fenestra, and terminating by a wide opening, about three twelfths of an inch below the internal auditory meatus, and one twelfth of an inch from the anterior part of the jugular fossa.

For the preparation of the auditory nerves, the

internal auditory meatus should be cut open, when the facial nerve will be seen at the inner or posterior side of the auditory nerve, and a distinct nervous communication found between them. The auditory nerve then divides into two parts, one to pass through innumerable perforations in the modiolus of the cochlea, to terminate on the spiral lamina, the other portion to divide into three principal branches, to enter the vestibule, to be distributed on the ampullæ of the membranous semicircular canals and the sacs of the vestibule.

For a preparation of the chord of the tympanum a portion of a head is required, in which the gustatory nerve has been dissected, with the chord of the tympanum entering the foramen of Glaser. The internal auditory meatus must be laid open, and the facial nerve traced from this to the aqueduct of Fallopius, and the superior branch of the Vidian on the exterior and upper surface of the petrous portion, and joining the facial nerve just after this has entered the aqueduct; the superior part of the tympanum and the squamous portion of the temporal bone should then be cut away, so that the whole of the membrane of the tympanum may be brought fully to view. The chord of the tympanum should then be traced from the foramen of Glaser: by removing the bone at the anterior part of the tympanum, it will be seen crossing the handle

of the hammer to join the facial nerve just at the entrance of this in the stylo-mastoid foramen, filaments may be traced to the laxator muscle of the tympanum. The facial nerve will be found in a canal passing downwards and backwards, but before entering this it gives a filament to the tensor muscle of the tympanum, and at the posterior part one to the muscle of the stapes; in tracing the facial nerve at the posterior part of the tympanum to the stylo-mastoid foramen much of this part of the petrous portion must be cut away, and great care will be required to preserve the junction with the chord of the tympanum.

There is another small nerve termed tympanine given off by the glosso-pharyngeal nerve just after this has emerged from the posterior lacerated foramen at the base of the skull. The small canal in which it passes must be laid open, and the side of the temporal bone with the external auditory meatus and membrane of the tympanum removed, and the nerve will be found entering the tympanum, and placed on that surface of the petrous portion, forming one of the boundaries of the tympanum, when it divides into filaments, one of which is sent into the carotic canal to join the sympathetic nerve, and another at the upper part of the termination of the Enstachian tube to communicate with the superior branch of the Vidian.

CHAPTER XII.

PREPARATIONS OF THE FIFTH NERVE.

The vertex having been removed, cut away by means of a chisel the orbital plate of the frontal bone, and the portion of the sphenoid forming the upper part of the superior lacerated orbital foramen; then saw off the outer side of the skull by carrying the saw a very little within this part and almost close to its inner table, but so that it may remove a portion of the outer side of the orbit. Then, by dividing the dura mater, trace the fifth to the Gasserian ganglion. Observe the three trunks sent off from this; then cut away a piece of bone so as to expose the second and third trunks; in doing this the saw must first be directed obliquely from the exterior angle of the orbit towards the margin of the round foramen, and then from the glenoid cavity towards the margin of the oval foramen, and the remaining parts should be cut away with a chisel.

The first trunk will be perceived passing through the superior lacerated orbital foramen, and may be traced by removing the orbital plate of the frontal bone.

The second trunk of the fifth, having passed through the round foramen, goes towards the inferior part of the orbit, but first gives off a branch termed malar. The orbital plate of the frontal bone must be cut away, and the portion of the sphenoid forming the upper part of the superior lacerated orbital foramen; the second trunk must then be traced passing through the round foramen, and the portion of bone separating this from the superior lacerated orbital foramen must be very carefully removed, and the malar branch will be seen to come off directly from the second trunk, and pass through the inferior lacerated orbital foramen towards the outer boundary of the orbit in a process of the membrane lining the bone, and having proceeded a short way, to divide into two branches, the temporal and malar. The temporal divides into two more; one of these goes through a small hole in the malar bone, and then through some of the fibres of the temporal muscle, and communicates with the temporal branches of the facial nerve, passing through the temporal fascia; in tracing this branch the bone, forming the outer boundary of the orbit and placed above it, should be gradually cut down with the bone nippers, and as it passes rather obliquely through the bone, it is very easily divided in cutting away the bone. The other of the temporal branches goes forward to the lachrymal gland, communicates with the lachrymal nerve, and

terminates in the conjunctive membrane and skin of the upper eye-lid.

The malar branch is rather more deeply placed than the temporal, and proceeds nearly at the bottom, within the exterior boundary of the orbit, through a hole in the malar bone to the cheek, to communicate with a branch of the facial nerve.

It is proper for the student to have his attention called to the malar nerve, because he may sometimes easily trace it with little trouble in his preparations of the fifth and the nerves of the orbit, and it will be therefore as well for him to defer dissecting it until he has finished most of the other parts of the nervous system.

Soon after the second trunk has passed through the round foramen it communicates with the spheno-palatine ganglion, which is placed in a recess between the base of the pterygoid processes and the superior part of the palatine bone, and is sometimes very small and hardly like a ganglion: in some instances it adheres to the second trunk, and communicates by one or two short branches. This sends off the Vidian nerve, which enters the pterygoid foramen, and will be particularly described with the sympathetic. Small branches may be also traced to the Schneiderian mem-

brane covering the septum, and one which passes downwards and forwards through the incisive foramen to the palate. The palatine nerves pass down, consisting of two or three branches; in their course some filaments are transmitted through small foramina to the membrane covering the turbinated bones; two or three small branches escape through foramina either in the palatine bone or at the junction of this with the pterygoid process of the sphenoid, to terminate on the soft palate; and a large nerve passes through the palatine foramen, to divide into branches to be distributed on the roof of the mouth, and in one instance to communicate near the first incisive tooth with the branch that passed through the incisive foramen.

The second trunk will be found passing forward to the upper lip in a groove between the antrum and the floor of the orbit, but just on entering this at the posterior and exterior edge of the antrum, it sends off one or two dental branches to give filaments to the cellular membrane, &c. on the exterior of the antrum and the gums, and then pass through the bone of the antrum, and between this and its membrane into a groove just above the alveolar processes; a second branch joins this a little further on, and another a short distance from the infra-orbital foramen, and from this combination the teeth of the upper jaw are supplied.

For a preparation of the dental nerves, the head of a youth should be chosen; the eye should be removed, and a portion of the bone forming the exterior boundary of the orbit, and the second trunk of the fifth should be traced from the round to the infra-orbital foramen, the dental branches will be observed entering the bone; the whole of the posterior part of the head, as well as the flesh, may be removed, and then this portion immersed in diluted muriatic acid; the exterior portions of the alveolar processes must be then cut away and the nerves traced to the teeth.

The dissection of the nerves of the teeth of the lower jaw is much more easy; the dental nerve will be seen to enter the jaw, and then all the flesh must be removed, and the part placed in diluted muriatic acid, when all the bone may be cut away that lies below the dental nerve, as well as that forming the external surface of the alveolar processes.

One ounce of muriatic acid mixed with eight ounces of water may be used. If the fluid be too acid, it destroys the texture of the nerves. The bone should be immersed in this, and when the hardness is sufficiently removed from the part to be particularly dissected, it should be placed in water for a few hours, as thus the acid will be considerably removed, and the hands and instruments not so much affected by it.

In the head, cut as described for a preparation of the second trunk, only some of the branches of the third can be shown, because the temporal and several other muscles have been already detached, but the branches going to the circumflex muscle of the palate and the chord of the tympanum may be best dissected in this.

The preparation for showing the branches of the third trunk in the most easy way is to be made in the following manner. Having procured the half of a head cut perpendicularly, and removed a small portion of the vertex, trace the fifth towards the Gasserian ganglion, and the small or inner portion, not entering into the ganglion, will be observed on the inner side of this trunk. The head then being placed on its outside, cut away as much of the basilar portion of the occipital bone, of the sphenoid, and the anterior extremity of the petrous portion of the temporal, as will expose and open into the oval foramen; then cut away the squamous portion of the temporal bone with a chisel, so as not to divide the temporal muscle; when a small portion of the bone has been removed, the adhesions between the bone and muscle may be easily separated and lacerations prevented. It will be also necessary to remove a small portion of the palate and the pterygoid process of the sphenoid bone.

On the other side of this preparation the branches

of the facial nerve may be dissected, and the communications between these and the superficial temporal nerve will be particularly seen.

If the arteries have been injected, branches may be traced upon these from the third of the fifth, to communicate with others from the spheno-palatine ganglion.

Another preparation may be made in the following manner. Dissect the branches of the facial nerve, divide the lower jaw about an inch and a half from its median point, and then the zygomatic arch, and the attachment of the temporal muscle to the coronoid process; divide also the capsular ligament, and remove the upper branch of the jaw. Some of the branches of the third trunk may then be traced; viz. the chord of the tympanum, as far as the foramen of Glaser; the filaments of the superficial temporal to the auricle, and the membrane lining the meatus; part of the bone forming the anterior boundary of this should be removed. The digastric branch of the facial nerve, giving filaments to the retracting and attollent muscles of the ear, and its communications with the glosso-pharyngeal nerve, may also be exhibited.

CHAPTER XIII.

PREPARATIONS OF THE SYMPATHETIC NERVE.

Before the student begins to dissect the origin of the sympathetic nerve, it will be best for him to observe in the base of a macerated skull the situation of the round and oval foramina, to pass a probe into the carotic canal, a bristle into the Vidian foramen, and one into the aqueduct of Fallopius from the anterior lacerated foramen at the base of the skull, and he will not only see the bearings of all these parts, but that the latter opening forms a convenient space for their several communications.

In preparations of the origin of the sympathetic, as well as for all others to show the minute nerves connected with these, the head should be that of an adult, as in the necessary divisions of the bone that of a young person is very apt to separate at the junction of the basilar process of the occipital with the sphenoid bone. It is also very difficult to keep a preparation perfect if the dissection has been begun

on the half of an adult head, cut by a perpendicular section through the nose and occiput; for so much of the bone is removed in laying bare the nerves, and this part is so much weakened in consequence that it is very apt to break. This dissection should be made therefore on one that has not been divided, and if it be afterwards wished to have the dissected side only left, a perpendicular section must be made rather beyond the middle line, and thus sufficient strength will be preserved.

Having exposed the trunks of the fifth, according to previous directions, divide the third near the oval foramen, and trace the second towards the orbit until it gives off the branch to the spheno-palatine ganglion, and from this the Vidian nerve will be seen to pass backwards in the spheno-palatine canal, which must be opened by gradually cutting away with a chisel and mallet the base of the pterygoid process, in which it is situated. The Vidian nerve will be found inclosed in a sheath of membrane, which must be opened and the superior branch traced to cross underneath the third trunk of the fifth, and over the carotic canal to the aqueduct of Fallopius; the inferior branch will be traced into the carotic canal, to join filaments on the internal carotid artery, communicating with the sixth.

When the internal carotid artery has been traced to the entrance of the carotic canal, the bone forming this must be cut away with a chisel, until about half of the surface of the artery is exposed. The sixth should be traced into the cavernous sinus, and the filaments of this nerve accompanying the internal carotid artery; the second and third trunks of the fifth may next be divided just below their foramina, and by turning up the superior ends of these, filaments may be traced passing from the sympathetic and the sixth to the Gasserian ganglion, the nerves of the orbit, and the spheno-palatine ganglion. A filament proceeds from the sympathetic in the carotic canal into the tympanum, to join the tympanine branch of the glosso-pharyngeal nerve; this must be traced by cutting away the bone very carefully between the carotic canal and the tympanum into this cavity, and then removing the superior part of the membrane of the tympanum and the external auditory meatus, when the filament will be found as described in the eleventh chapter.

For the dissection of the continuation of the sympathetic from the carotic canal to its termination, besides the directions given in the chapters respecting the nerves of the thoracic and abdominal viscera, a few inches of each spinal nerve should be left, the pleura should be stripped from the chest, and the

peritoneum from the abdomen. The three cervical ganglia will be found at the sides of the cervical vertebræ; ten or eleven thoracic ganglia about the junctions of the ribs with the bodies of the dorsal vertebræ; from three to six lumbar ganglia at the sides of the anterior part of the lumbar vertebræ, and the five sacral at the inner side of the anterior sacral foramina; and the single ganglion, in which the sympathetic of each side terminates, will be seen at the inferior part of the sacrum. There is a continuation from one ganglion to another termed the prolongation; the third cervical usually sends one part of this over and another under the subclavian artery to the first thoracic ganglion. From the outer side either of the ganglia or the prolongation all the branches are given to the spinal nerves; from the inner side the principal branches are given to form and communicate with the nerves of the viscera of the chest and abdomen, and to give filaments to the arteries, the cellular membrane, the absorbents and ligaments.

From the cervical portion some branches pass between the fibres of the long muscle directly to the cervical nerves; these branches must be first exposed by dividing the muscular fibres, and it will then be seen which of them enter the vertebral canal to accompany the vertebral artery; the part of the transverse

processes forming the vertebral canal must then be divided with the bone nippers, so as to expose the artery, and these branches will be seen forming a plexus on it, and communicating with the cervical nerves.

In the loins the branches from the outside of the ganglia will be seen passing between the fibres forming the origin of the psoas muscle, and must be exposed by dividing and removing portions of this muscle, and then traced to their union with the lumbar nerves.

The spinal canal may be opened, and thus the bearings of the sympathetic with the spinal nerves will be more particularly observed.

If a dry preparation is to be made, it must be proceeded with according to the directions for making preparations of the minute nerves.

CHAPTER XIV.

PREPARATIONS OF THE PHARYNGEAL PLEXUS AND THE NERVES OF THE THORACIC VISCERA.

The heart and its large vessels must be preserved, as well as most of the branches of the subclavian and carotid arteries; but the subject must not be injected, as these parts when distended cannot conveniently be drawn aside, and placed in such positions as are frequently necessary for the dissection of the nerves.

For the purpose of showing the pharyngeal plexus the lower jaw should be separated at its articulation, the whole of the sterno-mastoid muscle should be removed, and the sternal extremities of the sterno-hyoid and sterno-thyroid muscles detached, but left adhering to the hyoid bone. The insertion of the anterior scalenus muscle should be detached; the first rib should then be divided with the bone scissors near its middle, and the others near their angles; if the first be divided too near the spine, some of the branches of the first thoracic ganglion may be injured. A large part of each lung should be cut off, and

portions of the pericardium may be removed when the phrenic nerves have been traced to the diaphragm.

The tendon of the digastric muscle should be divided near the hyoid bone, and at the same time the insertion of the stylo-hyoid muscle may or may not be divided. The digastric branch of the facial nerve may be preserved, with the filaments given from this to the stylo-hyoid muscle, and to communicate with the glosso-pharyngeal nerve.

The ninth, the par vagum, and the superior laryngeal nerve, the first cervical ganglion of the sympathetic, the glosso-pharyngeal, and the accessory, must all be separated and made apparent, as from all these, branches communicating together, and forming the pharyngeal plexus, are sent to accompany the branches of the external carotid artery, and to terminate in the muscles of the pharynx; from this plexus, however, one branch is given off, termed the external laryngeal, to the pharynx and the crico-thyroideal muscle.

The descending branch of the ninth should first be dissected, and then the par vagum separated through its whole extent, and the filaments given from this traced a little way towards the cardiac plexuses: the superior cardiac nerve and the branches from the prolongation of the sympathetic and its ganglia should then be

traced, by carefully separating the carotid from its cellular attachments, and holding it towards the trachea, and it will be necessary to draw the trachea and pharynx forwards, by means of the chain hooks, for the purpose of keeping the parts a little on the stretch. When the carotid has been separated on its outer side, it may be necessary to do the same on its tracheal side, and particularly for seeing the branches of the recurrent, and their communications with the lateral cardiac plexus. It is, however, difficult to lay down precise directions; the parts must be carefully separated with the pointed instrument, and the dissection conducted with the utmost caution.

From the pharyngeal plexus, or the first cervical ganglion of the sympathetic, one or more filaments will be found passing behind the carotid artery, and forming the nerve called the superior cardiac. This will be found to communicate with other branches given from the prolongation of the sympathetic and its ganglia, and from the par vagum and recurrent, to form the lateral cardiac plexus, and from this some branches arise to pass on the branches of the subclavian artery, some over this vessel, and some underneath it, and communicate with the first thoracic ganglion; and on the right side some smaller branches pass over the arteria innominata, but by far the greater part passes behind it to communicate with the auricular, ventri-

cular, and pulmonary plexuses. These nerves are to be dissected by carefully separating the branches of the arteries and veins, the absorbent glands and cellular membrane; and the branches on the arteries themselves require considerable care and gentleness, for pulling them rudely with the forceps, or attempting to separate them hastily in any manner, will frequently destroy them.

On the left side the dissection must be conducted in the same way, but it will be found that the principal part of the branches of the left lateral cardiac plexus, at the bottom of the neck, passes before and behind the arch of the aorta, and the rest along the subclavian artery, to communicate with the auricular and ventricular plexuses, and give branches to the large vessels and unite with others from the right side.

The ventricular plexus, or the more solid part of it usually called the cardiac ganglion, will be found underneath the arch of the aorta; it receives the principal part of the right and left lateral cardiac plexuses, and communicates with the auricular and left posterior pulmonary plexuses, and sends branches to accompany each coronary artery, to terminate in the ventricles of the heart.

The auricular plexus is situated on the trachea near

its bifurcation; it communicates with each recurrent and the ventricular plexus, and sends branches before and behind the pulmonary artery to unite with others from the anterior pulmonary plexuses, to terminate in the auricles.

The pulmonary plexuses must next be traced, each anterior one consists of a few branches of the par vagum and recurrent; some filaments go from it to the anterior part of the lung, and others to communicate with branches of the auricular plexus to terminate in the auricles.

The posterior pulmonary plexuses are given from the par vagum at the root of each lung, and may be traced to follow the ramifications of the trachea; these also communicate with each thoracic plexus, and the ventricular plexuses, and must be traced to their terminations in the lungs, by following the branches of the trachea from the posterior parts of the lungs, at the same time the branches of the pulmonary artery and veins must be preserved.

The thoracic plexuses consist of filaments from the two or three first thoracic ganglia; these communicate with each other, by sending branches across the spine, and with the pulmonary and ventricular plexuses. The terminations and communications of these nerves

may be more satisfactorily seen by carefully dividing the aorta at its arch: this, however, should not be done in making a dry preparation, as the parts thus become so much displaced; but for a wet preparation this inconvenience may be considerably remedied by drawing the cut edges of the artery together again by two or three long ligatures, and loosening them whenever it is necessary to make an examination.

This dissection can only be performed by great care. The nerves forming each lateral cardiac plexus should be first traced to the bottom of the neck, and then their continuation along the great vessels to the heart, by proceeding a short distance first on one side, and then on the other. It will be necessary to support the heart, by placing cloths underneath it, and to hold the vessels apart with the chain hooks, whilst portions of fat, cellular membrane, and pericardium, are removed. Particular caution is required in separating the attachments of the vessels, as the junctions of the nerves passing over and underneath them may otherwise be divided. However slow the progress may appear in attempting to preserve every nerve, the dissection will in the end prove satisfactory; for, by hurry and impatience, some branches will be divided, and then inextricable confusion must be the consequence.

Each trunk of the par vagum may be also traced on the œsophagus, to terminate in the stomach, &c.

CHAPTER XV.

PREPARATIONS OF THE NERVES OF THE ABDOMINAL VISCERA.

THE subject must be injected with coarse injection, as the nerves are thus not only more easily traced, but the delicate parts, such as the mesentery, &c. acquire some firmness, and are not so easily destroyed; it is however disadvantageous to have the minute arteries filled, as these are so numerous, and become so much intermixed with the nervous filament, as to make their separation very difficult and almost impossible.

A part of a subject divided at the seventh dorsal vertebra will be sufficient: the diaphragm should be separated from its attachments to the ribs so as to allow all these, except the last, to be removed near their angles. The diaphragm should be left attached to the spine and the last rib. The penis should be separated from the pubes, and the internal pudendal nerves carefully preserved, and the bone of the pubes and ischium and a great part of the ilium removed by sawing through the lattera short distance from the sacrum. The thighs should be removed at the hip joint.

Part of the large lobe of the liver and also of the small one should be removed, but neither the gall-bladder nor Glisson's capsule, nor the lesser omentum should be injured.

The right phrenic nerve should be traced, and its communication with a branch of the semilunar ganglion in a small ganglion which sends a branch to the left hepatic plexus, and filaments to the outside of the inferior cava; the left phrenic nerve should also be traced, and its communications by very fine filaments from the left semilunar ganglion; some of these accompany the phrenic artery, and the rest pass across the cardiac termination of the œsophagus to the left hepatic plexus.

The great splanchnic nerves should be traced from the chest, and will be seen passing through the diaphragm near the spine, to the semilunar ganglia, and these will be found placed on each side of the cœliac artery and the aorta just after this has passed through the diaphragm.

The right hepatic plexus will be found surrounding the hepatic arteries and the gall ducts. Its communications with the semilunar ganglia will be seen, and the branches sent from it along the pyloric and left inferior gastric arteries, to communicate with those of

each trunk of the par vagum, and terminate on the stomach, whilst other branches are sent from it to the duodenum and pancreas.

The left hepatic plexus is formed of branches from the left trunk of the par vagum and from the left semilunar ganglion, sent across the cardiac termination of the œsophagus; also from the small ganglion forming the communication between the right semilunar ganglion and the right phrenic nerve, passing behind the hepatic vessels; it then passes in the folds of the lesser omentum to the liver, and communicates with the right plexus, to accompany the branches of the hepatic artery and vein of the porta into the liver.

The cœliac plexus is seen surrounding the cœliac artery, and frequently in the form of a membranous sheath. Branches may be traced from this along the splenic and pancreatic arteries to the spleen and pancreas, and along the branch of the splenic artery usually termed the left inferior gastric artery, to the stomach.

The superior mesenteric plexus must next be traced; it surrounds the superior mesenteric artery in the form of a membranous sheath; it arises principally from the right semilunar ganglion, but communi-

cates with the left and the cœliac plexus. Its branches must be traced along the branches of the superior mesenteric artery to the small intestines; and along the iliocolic, and the right colic arteries to the cœcum and colon, and by turning up the arch of the colon towards the sternum, the branches accompanying the middle colic artery may be traced to this part; the communication also with the aortic plexus may be traced. The mesentery and mesocolon should not be divided more than is absolutely necessary, as if these parts are too much separated from the arteries and nerves, great confusion will be the consequence.

Numerous branches may be traced from the semilunar ganglia to the renal capsules, and the connexion of these parts will frequently be found more like the continuation of the ganglionic structure into that of the renal capsules, than ordinary branches of nerves.

Each emulgent plexus receives branches from the semilunar ganglion; it receives also the lesser splanchnic nerve, and frequently another branch from the last thoracic ganglion or its prolongation; these branches may be traced along the branches of the emulgent artery into the substance of the kidney. It is necessary to separate the cellular attachments of the kidney so that it may be turned towards the opposite side, as

many of the branches of this plexus are best observed and most easily dissected on the posterior surface of the emulgent artery.

The aortic plexus is composed of branches of the semilunar ganglia, and those of the lumbar portions of the sympathetic nerve of each side. It is situated principally upon, and at the sides of the aorta. It gives off the inferior mesenteric plexus to accompany the branches of the inferior mesenteric artery, to terminate on the left side of the colon and the rectum. It then divides on the last lumbar vertebra into right and left hypogastric plexuses: it forms communications with the emulgent and spermatic plexuses; it gives filaments to the ureters and the coats of the arteries; it communicates with the superior mesenteric plexus and sends branches on the colic branches of the superior mesenteric artery to terminate on the right side and the arch of the colon.

The dissection of each spermatic plexus requires particular nicety; it receives communications from the emulgent and the aortic plexuses. It follows the spermatic artery to the testicle and is joined near this part by a filament from the hypogastric plexus accompanying the vas deferens. It usually adheres in some degree to the posterior part of the mesocolon and in

raising the colon may be easily destroyed. It must be carefully separated from this part along with the artery and vein, and when it has been sufficiently loosened, the cellular membrane and branches of veins may be easily removed from it, and particularly if a piece of card is placed behind it.

Each hypogastric plexus passes into the pelvis at the back of the bladder, and communicates with some of the sacral ganglia; it receives branches from the third and fourth sacral nerves, and forms a membranous expansion towards the lateral and posterior part of the bladder, which gives off branches to terminate in the bladder, rectum, vesicula seminalis, vas deferens, and prostate gland.

These nerves should be dissected as much as possible in the preceding order. Great care and nicety are required, for if the mesentery and mesocolon be destroyed, much confusion will be created and the dissection made very tedious and unsatisfactory. It will be necessary to separate the peritoneum from the abdominal muscles on each side, and on proceeding towards the loins, the colon on each side will be raised from its cellular attachments, and thus every facility of turning the right portion of this intestine to the left side, and that of the left, to the right will be afforded

for allowing the nerves placed behind these parts to be readily dissected.

For the purpose of exhibiting all these nerves dry, either a series of preparations must be made or several small portions of the intestines only left, which must be distended with air. The stomach must have a considerable portion removed from its large curvature, the remaining part must then be filled with cloth or horse hair and sewed up in the form of a contracted stomach. Without these diminutions the nerves will be hidden. The rectum and bladder may be very moderately distended, and a bougie passed into the urethra. When the parts are sufficiently dry, the end of each portion of the intestine, and the sewed edges of the stomach may be cut off, and the hair removed from the rectum; the bougie cannot easily be drawn out, it may therefore be cut off close to the orifice of the urethra and left; all these parts must then be varnished, and the muscles, nerves, &c., treated according to the preceding directions.

If the preparation be kept in spirits every part of the stomach and intestines should remain perfect.

CHAPTER XVI.

A PREPARATION OF THE NERVES OF THE WHOLE BODY.

If a preparation of the nerves of the whole body be required, an incision should be made from the top of the sternum to the symphysis of the pubes; the abdomen should be opened by carrying the knife between the straight muscles, and the chest by sawing through the sternum. The sternum may be removed by separating the clavicle, and dividing the cartilages of the ribs; or after it has been sawn through, one or both sides may either be removed or left: if left, it will be required to expose a portion of most of the dorsal nerves, and then divide each rib near its angle by means of the bone scissors, to allow the sternum and the anterior portions of the ribs to be turned back, so as to bring to view the contents of the chest, but the removal of one or both sides of the sternum for a preparation of the adult body is to be preferred. If the subject is to be injected, so as to exhibit the arteries, this must of course be done before any part is removed. The operation of opening the heart, and

fixing the pipes so as not to interfere with the nerves, requires the greatest care, and even with every precaution, it is most probable that the nerves of this organ will be too much interfered with for making a perfect dissection. The display of the nerves alone is a work requiring much perseverance, and the preservation of the arteries at the same time will add very considerably to the labour.

The greatest part of each lung must be removed sufficiently far from its root for leaving the par vagum and its principal branches perfect; the pleura must be carefully stripped off the ribs, but when the posterior mediastinum is approached, gentleness is necessary. The pericardium should be opened so as to avoid the phrenic nerves.

For showing the nerves of the abdominal viscera it may be necessary to cut away a portion of the abdominal muscles, but as these will retract considerably in a dry preparation, the removal of the upper two thirds of the straight muscle of each side will give sufficient space; but if the viscera can be conveniently dissected without this mutilation, it will be best to wait till the parts are nearly dry. The right lateral ligament of the liver may be divided, and a considerable part of the right lobe removed; some care is required for avoiding any injury to this part of the

diaphragm, as the communication between the phrenic nerve and the right semilunar ganglion may be otherwise destroyed. The left lateral ligament may also be divided, and a portion of the left lobe removed; Glisson's capsule and the lesser omentum must be kept perfect. The intestines should be opened in several distant places, and water poured into them and the stomach, so as to wash out their contents; the rectum must be particularly attended to, as every portion of feculent matter must be removed, otherwise the antiseptic fluids in which the subject is to be immersed will not only be entirely spoiled, but will imbue every part with their acquired impurities. The peritoneum may be stripped off the abdominal muscles, and the colon detached on each side from its connexion with the loins, but this must be effected with care, as the spermatic arteries and plexuses of nerves adhere to these parts, and may be destroyed. The exterior portion of the spleen and each kidney may also be removed. The iliac veins may be opened, and the inferior cava, if it can be done conveniently, and as much blood as possible pressed from the heart towards this part. The urine must be pressed out of the bladder. A piece of bone must be removed from the back of the head by a trephine for the purpose of extracting the brain.

The skin of the whole body must now be separated

in the following manner:—An incision must be made by keeping the blade of the knife horizontal, for the skin alone must be removed, and the fat and cellular membrane left, as the cutaneous nerves are very much imbedded in these parts; it must be done in the same manner as in paring the yellow part of the rind of an orange from the white. If this be not removed now, the parts beneath will become putrid, as the antiseptic liquors cannot penetrate the cuticle, and not easily through the perfect skin; in the scalp, also, the skin must be carefully pared off, as many of the nerves will be destroyed by cutting too near.

It will be best now to trace the nerves, and to begin by following the branches of the second cervical to the ear and face, and the parts about the angle of the jaw, and communications will be found between these and branches of the facial nerve. The parotid gland must be carefully divided, or removed by picking it out with a pointed instrument and the forceps, until the different branches of the facial nerve are exposed, each of which must be traced only a short distance at a time, for if one branch were to be followed entirely across the face, many communicating filaments would be divided. Other branches from the second and third cervical nerves may be traced to the different parts of the neck, and the acromion and clavicle. The sterno-cleido-mastoid muscle may next be entirely

exposed, or its inferior extremity separated, so as to allow of its being turned aside; part of the internal jugular vein may then be removed, and the descending branches of the ninth, and its communications with the first and second cervical nerves traced. The great pectoral muscle may next be divided at about one-fourth of its breadth from its insertion; the fat, &c., must be carefully separated at the inner edge of the biceps muscle, and the nerves exposed upwards towards the axilla, and also downwards towards the hand.

Each dorsal nerve passing between the ribs may be exposed to within about an inch of the spine, and this distance is mentioned, as without more care than can be used in this stage of the dissection, the communications with the sympathetic may be destroyed.

The branches of the lumbar nerves may next be separated, which pass to the abdominal muscles, the spermatic chord, and to the skin of the thigh, as well as to form the anterior crural, the obturator, and the sciatic nerves; and the finger may be carried between the side of the bladder and pelvis for separating the cellular membrane, so as to allow the solution to penetrate this part. The cutaneous branches from the lumbar nerves, as well as the anterior crural and obturator nerves, may be traced in the anterior part of the thigh.

The terminations of the external and internal branches of the dorsal nerves on the side of the chest and abdomen may be traced either now or afterwards.

The subject may now be turned with its back uppermost, and the occipital nerve and a branch of the second cervical traced to the scalp at the back of the head. The cutaneous branches of the posterior trunks of several of the other cervical nerves may be also traced, as well as those of the dorsal, and the lower the situation of the latter the further they will be found from the spinous processes. The cutaneous branches from the posterior trunks of the three first lumbar nerves may be dissected, as well as those of the sacral; the latter are traced with some difficulty, but will be found passing out at the posterior sacral foramina, and communicating with the last lumbar and each other, and terminating in several branches in the skin about the sacrum and anus. If it be wished to trace the preceding sacral branches to their origin from the posterior trunks, and the other branches of these given to the muscles, the fascia and the muscular fibres through which the cutaneous branches have passed must be divided.

The branch passing to the dorsum and glans of the penis, others to the scrotum and the anterior surface

of the penis, the anus, &c., may be exposed by carefully separating the fat in the perineum.

The large gluteal muscle on one side may remain whole, and on the other be divided across its fibres, so as to show the nerves going to it. The sciatic nerve will be thus exposed, as well as the posterior cutaneous branches passing down the thigh, and care must be taken that these are not divided with the gluteal muscle. The branches passing to the middle and smallest gluteal muscles just above the pyriform muscle, may be separated, and it is necessary to take care not to divide a branch of the sciatic passing to the geminous and quadrate muscles. The sciatic nerve may be traced down the thigh, and dividing into its several branches to terminate on this part, and the leg and foot, but of these it is not necessary to speak particularly.

The preceding outline of the dissection may be followed as far as possible before the subject is put into the solution, but if it should become putrid before so much has been effected, it may be immersed once or oftener.

When so much of the dissection has been done it will not even yet be advisable to finish every separate portion, but to trace all the nerves a little further and separate the muscles more, and again immerse the

subject in the solution, if necessary; but if every part has been completely changed by this, the dissection of any portion may be proceeded with, and entirely finished.

At the termination of the cutaneous nerves small portions of fascia should be left attached to the muscles, as the nerves will be thus kept in their proper situation, and much trouble and confusion prevented. When the dissection has been finished and the subject treated according to the directions in a former chapter, by placing it in the solution, &c., two holes should be made in the vertex, through which a string may be put for suspending it. The hands should be treated as in the preparation of an arm, and then fixed to such convenient supports, by means of strings, &c., as will keep them in the required position. A heavy weight should be suspended from each heel, otherwise the spine will be much shortened by the shrinking of the intervertebral substances, and the knees so bent by the contraction of the muscles of the thigh as to spoil the appearance of the preparation.

It might be expected that every nerve would be particularly noticed in this work, but this would not have answered any useful purpose, as the general distribution of a great part of the nervous system may be easily understood with the assistance of books on descriptive anatomy.

CHAPTER XVII.

OF PREPARATIONS OF THE PARTS CONCERNED IN HERNIA.

Having chosen a thin subject, the abdomen of which has been opened, the peritoneum is to be stripped off from the inside of the abdominal muscles, or rather from the inside of the transverse and iliac fascia, and at the same time all the cellular membrane and fat removed. The skin and superficial fascia, and every portion of fat and cellular membrane must then be separated from the external oblique muscle, and likewise from the upper part of the thigh. The tendon of the external oblique muscle is then to be divided by beginning a very short distance from the anterior and superior spinous process of the ilium, about the third of an inch above Poupart's ligament, and continuing the incision so as to reach just above the external ring, which must be left entire; it may however be divided a little higher by the side of the rectus muscle, as it may then be sufficiently raised for exposing the lower margin of the internal oblique an transversed muscles,

the lower edge of which must be carefully separated from the transverse fascia; and if this separation is not sufficient for bringing the fascia properly into view, a small portion of the muscle must be removed. This being done, the round ligament or spermatic chord will be seen coming from the abdomen, at which place the transverse fascia is much thinner than at any other part. If the fascia lata on the outside of the thigh be removed, and the handle of a scalpel passed behind Poupart's ligament, the iliac fascia may be separated some distance from the muscle, and thus both of the fasciæ arising from Poupart's ligament, together with that portion arising from the bone of the pubes, may be seen, forming a complete barrier to the protrusion of the bowels, except where the spermatic chord and femoral vessels escape from the abdomen. These parts are shown to much greater advantage if the femoral vessels are removed.

If it be desired, other preparations can be made to show the exact position of the blood vessels, and likewise the falciform process of the broad fascia, but these must be done according to the same plan.

If the parts already described are to be shown in a preparation where the whole limb is preserved, the dissection may be finished according to the wish of the

anatomist, but if it be intended entirely for a preparation of the parts concerned in hernia, it will be best to divide the subject about the beginning of the lumbar vertebræ, and then divide the pelvis through the sacrum and symphysis pubis, leaving about eight or nine inches of the thigh. It is best to remove the largest gluteal muscle and most of the muscles on the thigh, but this may depend on the wish of the anatomist.

When the dissection is finished, the part must be put into the solution of oxymuriate of mercury for about a fortnight. When it is taken out it should be suspended by a string fixed to the vertebræ, another being fastened to the corner of the abdominal muscles, so as to keep these parts and the transverse fascia on the stretch, and likewise to prevent them from falling too much in contact with the spine.

When it is suspended, the tendon of the external oblique muscle, the transverse, and iliac fascia are to be covered with mastich varnish on three succeeding days. The tendon and fascia must be finished according to the directions given in the general illustration for the preparation of tendons. The edges of the external ring, and the separated portion of the tendon of the external oblique muscle, should be put in a proper position before they are quite stiff.

CHAPTER XVIII.

PREPARATIONS OF THE LIVER.

In order to preserve the natural appearance and size of the liver, it is necessary that the blood vessels and excretory ducts which compose so great a part of it, should be filled with injection to keep them distended. The best method in injecting the liver is to add one fifth part of turpentine varnish to white spirit varnish, and some colouring matter, as red lead, and first gently throw some of this into the vein of the porta and the excretory ducts, and then some coarse injection, which is necessary for the distension of the larger vessels. Some coarse injection should likewise be thrown into the hepatic artery. The liver does not require to be heated before it is injected.

After the injection is finished, if it be a small liver, as a dog's, a fortnight will be sufficient for its immersion in the solution of oxymuriate of mercury; but if a much larger one, a month will be necessary.

When it is dry it must be painted the natural colour, and then varnished with the copal varnish as often as may appear necessary.

The paint for the liver is made by mixing together lake, vermilion, and Prussian blue.

CHAPTER XIX.

ON PREPARATIONS OF THE JOINTS.

The large bones should if possible be bored, and have the marrow removed, but even then the joints in general are very unfavourable parts for making dry preparations, on account of the quantity of fat contained in them. The marrow should be extracted from the bone, and when the dissection of any one is completed, and all the fat removed, it must be put into the solution of the oxymuriate of mercury, where it must remain a fortnight, and it must then be varnished twice with mastich varnish, and in the course of a few weeks, when it appears to be perfectly dry, it must be covered twice with the best copal varnish.

The joint should not be taken from an old subject, and the varnish should never be applied to the bone.

In the same manner a whole limb, or indeed a whole subject, may be preserved so as to show all the joints.

When the ligaments of a whole subject are to be preserved, it might be advisable to fix the different parts in such a manner, that when the ligaments, &c. have become dry, the exact situation of every bone may be kept.

In preserving the capsular and other ligaments of the knee, it is best to saw through the patella transversely, and as the capsular ligament dries, it should from time to time be put into a proper form, by pressing it outwards with the finger.

CHAPTER XX.

ON PREPARATIONS OF THE LUNGS AND HEART.

The heart and lungs may be preserved dry so as to have their natural appearance. When it is wished to preserve the heart alone, it may be filled according to the usual method with plaster of Paris, or any other coarse injection. When both the heart and lungs are to be preserved together, the heart should be first injected as has just now been directed, and a pipe fixed securely in the trachea. It must then be injected with plaster of Paris.

In filling the trachea the injection should be sent in until with moderate force no more will enter. The heart and lungs should be from a young subject, and as free from fat as possible. And the same precaution should be observed in the choice of the parts when they are to be taken from an animal.

When it is wished to preserve the lungs alone, it is better to fill the branches of the pulmonary artery by

fixing a pipe in the trunk of this artery. The pulmonary veins may be filled by fixing the pipe in the left auricle; the trachea is then to be injected as before described. After the injection is finished, all the fat and cellular membrane should be removed, when the part should be immersed in the solution of oxymuriate of mercury for a fortnight.

When it is taken out it must be hung up to dry. The trachea and the whole surface of the lungs should be immediately varnished with mastich varnish, and then the trachea alone should be varnished on two or three succeeding days.

The heart will require painting. To give the natural appearance both ventricles may be painted red, the venæ cavæ and pulmonary artery and right auricle purple, and the left auricle and aorta red. Or the whole of the right side of the heart may be made purple, and the left red. The coronary arteries and vein will also require painting.

When the lungs are dry they must be painted with the red paint used for the muscles, and must then be varnished, as well as the trachea, with mastich and copal varnishes.

In making preparations of the heart to show its

internal structure, its cavities should be opened so as not to injure the valves, and when it is wished to show all the valves distinctly it is better to divide the heart so as to make a separate preparation of each side. Before doing this the right ventricle should be opened nearly as far as the origin of the pulmonary artery, and then the pulmonary artery itself should be divided nearly down to the valves, that it may thus be seen how to cut between two of the semilunar valves, so that they may all be preserved perfect; any further dissection required to show the tricuspid valves should be made at the same time. Nearly in the same manner the left ventricle and aorta must be opened, after which the two sides of the heart should be separated.

In making these dissections, about two or three inches of the aorta and pulmonary artery should be left. So much of each auricle may be removed as to show distinctly the opening into the ventricles.

It is necessary to remove all the fat and cellular membrane, and after the dissection is finished, the parts are to be immersed in the solution of oxymuriate of mercury for a fortnight.

When the parts are taken out, they must be suspended in the most convenient position for the preser-

vation of the valves, which should be kept as much upon the stretch as possible. In several instances after the auricle has been opened and a great part of it removed, the rest has been sewed round a common ring.

It will also be proper, by hanging small weights to different parts, or by fixing them with strings in different directions, to keep all the parts constantly on the stretch, until they are perfectly dry. If these precautions are not attended to, the valves cannot be preserved so as to be satisfactorily shown, because the heart when left to itself contracts so much in drying as hardly to bear any resemblance of the shape it had in its fresh state.

It is necessary to put some small bits of wood into the semilunar valves to keep them separated from the vessels, or they will dry so much in contact with the other parts as not to be distinctly seen.

After this the valves, the pulmonary artery and aorta, must be varnished with mastich varnish on three or four succeeding days. When the heart is perfectly dry all the muscular part may be coloured with the red paint. It must then be varnished two or three times over with white spirit varnish, and twice with copal varnish.

CHAPTER XXI.

ON PREPARATIONS OF ANIMALS.

When it is intended to make preparations of animals which are very putrid, before beginning the dissection, some of the solution of oxymuriate of mercury should be injected into the arteries, and then if it is not wished to fill the vessels with coarse injection for their preservation, the skin should if possible be entirely removed. If the putrefactive process has not been stopped by the injection, the animal should be immersed in the solution of oxymuriate of mercury for twenty-four hours, or longer if necessary. This might be done with part of the skin remaining, but it usually contains so much dirt, and the hairs so frequently fall off, and by adhering to the different parts, not only spoil their appearance if the dissection has been begun, but likewise spoil the solution for many purposes, so that if this method is pursued, the animal ought at least to be well washed before it is immersed in the solution.

The dissection must be finished in the usual way,

when the animal must be immersed in the solution of oxymuriate of mercury a proper time, according to the directions given in the general illustration.

When it is taken out of the solution for the purpose of being dried, if it has naturally white flesh, as a cat, rabbit, common fowl, or fish, it should be varnished over with mastich varnish immediately after having been dried with a cloth, and this should be repeated the next day. The tendons, nerves, &c. should be managed according to the directions already given for the preservation of these parts in the general illustration, and the muscles, when dry, should be tinged with paint of their natural colour; the whole animal should then be varnished several times.

CHAPTER XXII.

ON VARNISHES AND PAINTS.

As the brushes used in varnishing and painting, when left for some hours exposed to the air, are entirely spoiled, and in this manner much expense is incurred, it is proper to keep them in vials.

All the brushes used for varnishes made with spirit of turpentine, should be preserved in vials containing spirit of turpentine, and those used for the white spirit varnish, or any other varnish made with spirit of wine, should be put in vials containing rectified spirit of wine.

Camels' hair brushes made in quills are the best for all purposes, for the large ones made in tin are fastened with resin, or some similar substance, therefore, if these are put into vials with spirit of turpentine, the resin becomes dissolved, and mixes with the varnish that is about to be used, and will spoil the whole preparation. If large brushes made in tin and

fastened with glue were used this objection would not exist to the same extent.

Paints mixed with oil and varnish were formerly used for colouring the different parts of preparations, but latterly water-colours only have been employed, except for the nerves, which require white paint mixed with a little drying oil and spirit of turpentine. The white paint should be procured in a small bladder; a puncture may be made in this and a little squeezed out as it is wanted, and the aperture may be stopped up with a small nail.

CHAPTER XXIII.

ON INJECTIONS.

OF INJECTIONS WHICH REQUIRE THE SUBJECT TO BE HEATED.

As in warm weather the coarse injection generally used is apt to escape from wounds that may have been made in the vessels, the following has, for some purposes, been substituted.

Red Injection.

Wax, four ounces,
Common copal varnish, half an ounce,
Red lead, half an ounce,
Vermilion, two drachms;
these are to be melted together in the ordinary way.

Green Injection.

Wax, four ounces,
Blue verditer, half an ounce,
Common copal varnish half an ounce.

Blue Injection.

The same as for the green, with the addition of half a drachm of powdered Prussian blue.

ON COLD INJECTIONS.

Nothing tends to hasten the process of putrefaction so much as heat, and it has always been a most desirable object on this account to succeed in injecting the subject without previously placing it in hot water, as well as to save the attendant trouble and inconvenience. For ordinary purposes white spirit varnish, to which vermilion has been added, and if possible some oil of lavender, is to be heated in a vessel placed in hot water. This varnish very soon becomes hot, and care must be taken that a flame does not come near it, as it so easily catches fire. The syringe being heated, this injection is to be sent into the arteries in the usual way, and the coarse injection immediately after, a little of the varnish having been previously allowed to escape from the artery. The vessels will not hold much of the coarse injection, and its principal use is for filling the largest. The spirituous part of the varnish is almost immediately absorbed by the coats of the vessels, and what remains becomes hard; so that in dissecting there is not the same unpleasant stickiness that is experienced in using injections made with paint or turpentine varnishes.

Plaster of Paris makes a very good injection for many anatomical purposes, and has the great advantage of not requiring either the subject or any of the instruments to be heated. It is to be used in the following

manner. The pipes being fixed in the blood-vessels at which the injection is to enter, plaster of Paris, to which some colouring matter has been added, as red lead or Prussian blue, must be put into a common basin or mortar, and rubbed with a pestle a little, so as to break down any lumps that it contains; then water is to be added very gradually, until it has the consistence of cream; as soon as it is mixed, for it sets in a few minutes, it is to be drawn into the syringe and immediately injected. A vessel containing cold water must be in readiness, that the syringe may be washed out as soon as ever the injection has been used, otherwise it will set in so hard as to make it necessary to take the syringe in pieces in order to clean it, which cannot be done without very great trouble. It will be very useful and convenient for anatomical purposes in general, and especially in the examination of morbid bodies, for it can be carried about with so little trouble, and the method of using it is so easy. A very few minutes after the injection the subject may be dissected, and if any thing very uncommon occurs, the parts may be made into a good preparation; this advantage is not derivable from any other cold injection.

CHAPTER XXIV.

ON THE PRESERVATION OF ANIMALS IN GENERAL.

The solution of oxymuriate of mercury recommended for anatomical preparations is calculated for preserving all kinds of animals; but as many of these may be well preserved by other means, I shall only give a few directions for the management of fishes.

All the mucus must be well washed off with soap and water; in doing this great care is required, otherwise many of the scales will be removed, and their natural appearance injured.

If any quantity of mucus be suffered to remain when the fish is put into the solution of the oxymuriate of mercury, it will form an opaque pellicle, which will not be removed without much difficulty, and if left will spoil the appearance. When all the mucus has been washed away, the abdomen must be cut open, and its contents removed; the eyes must be cut out; the back-bone and the greatest part of the flesh must be

taken out, and then the fish must be put into the solution of oxymuriate of mercury, where it must remain for some time. When it is taken out it must be filled with tow and plaster of Paris, mixed with water so as to have the consistence of cream. The abdomen must be sewed up. It must then be hung up to dry. The gills must be painted red. When it is dry it must be varnished.

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